

# Continuous Epidural Analgesia for Labour and Delivery: Review of 1000 Cases

PATRICIA F. KANDEL, M.D., W. E. SPOEREL, M.D., F.R.C.P.[C] and  
R. A. H. KINCH, M.D., F.R.C.S.[C], *London, Ont.*

In six years in London, Ontario, the use of continuous lumbar epidural analgesia in deliveries increased from 5% to over 50%. Its effect was assessed in 1000 consecutive cases, all vertex presentations. In established labour, epidural analgesia was started for pain relief and was maintained with intermittent injections until delivery; in 34% the duration exceeded four hours. Labour was not retarded, but there was an inadvertent selection of patients with slow and painful progress. Forceps delivery was used in 89%, mid-forceps in 11.8% and forceps rotation in 17.7%; 2.4% required Cesarean section. Fetal condition was excellent (Apgar rating of 7 or greater in 96.7%). Postpartum complications could not be directly related to the technique. Continuous epidural analgesia gives superior relief of pain but calls for experienced anesthetists and adjustments in obstetrical management and nursing care.

CONTINUOUS lumbar epidural analgesia<sup>1, 2</sup> and continuous caudal anesthesia<sup>3</sup> are considered by Moore<sup>4</sup> to be "the ultimate in providing pain relief for the parturient". While a single injection lumbar epidural block is used as a routine procedure in obstetrics,<sup>5-8</sup> a continuous technique, i.e. the introduction of a plastic catheter into the epidural space allowing repeated injections, is usually reserved for specially selected cases. Based on Cleland's studies of the conduction of pain in nerves during labour and delivery,<sup>8</sup> Bromage<sup>9</sup> proposed continuous lumbar epidural analgesia instead of the caudal approach and reported that this was a safe and satisfactory technique.

The use of an indwelling plastic catheter is well established and, if the operator has sufficient experience, does not add to the risk of lumbar epidural analgesia. It gives this technique a great flexibility: it provides satisfactory analgesia for any duration of labour, and anesthesia for delivery. Considerably less local anesthetic is needed than with caudal analgesia. The use of this technique will reduce exposure to the hazards of general anesthesia and narcotic analgesics.

We use a catheter almost routinely when epidural analgesia is requested by the obstetrician,<sup>10</sup> and a single injection only when delivery is imminent. The satisfaction of patients and obstetricians with this technique is reflected in the steady increase in requests for epidural analgesia during the past five years (Fig. 1), such requests rising from 5% in 1960 to over 50% in 1965. This marked

En six ans à London, Ontario, l'emploi de l'analgésie épidurale continue durant les accouchements est passé de 5% à plus de 50%. On a évalué ses résultats dans 1000 cas consécutifs, tous des présentations du sommet. Dans les cas où le travail était déclenché, on a amorcé l'analgésie épidurale pour soulager la douleur et on l'a maintenue au moyen d'injections intermittentes jusqu'au moment de la délivrance; dans 34% des cas, cette méthode a été appliquée pendant plus de quatre heures. Le travail n'a pas été retardé, bien que la série ait comporté, par hasard, un certain nombre de femmes dont le travail était lent et pénible. Le forceps a été employé dans 89% des cas, les forceps au détroit moyen dans 11.8% des cas et la rotation par forceps dans 17.7%; on dû procéder à une section césarienne dans 2.4% des cas. L'état du fœtus était excellent (Apgar supérieur à sept dans 96.7% des cas). Les complications du post-partum n'ont pu être attribuées à la technique. L'analgésie épidurale continue permet d'obtenir un meilleur soulagement de la douleur, mais exige la présence d'anesthésistes expérimentés, des modifications des manœuvres obstétricales et des soins infirmiers.

change in the anesthetic management of obstetrical patients has had considerable influence on obstetrical management and nursing care. We have made a retrospective study of 1000 vaginal deliveries managed by continuous epidural analgesia to examine the effects of this technique on the mother, the infant, the progress and management of labour and delivery, and to determine the side effects and complications of this procedure.

## METHOD OF STUDY

Records of over 1200 consecutive patients who received epidural analgesia were examined. Continuous epidural anesthesia was defined as two or more injections given through an epidural catheter. Thus, all "single-dose" epidurals (143 cases) were rejected even if a catheter had been introduced. We eliminated multiple births (six cases), breech presentations (20 cases) and all Cesarean sections in which epidural anesthesia was administered for the surgical procedure only. Pregnancies in which the fetus was not viable at the time of labour were also excluded. One thousand cases qualified for our study. These patients received one or more injections during the first stage of labour, and a terminal injection to provide anesthesia for delivery. All had a single viable pregnancy with vertex presentation and all were considered suitable for vaginal delivery.

To point up differences introduced by continuous epidural analgesia, we have compared our series with data from this hospital for the year 1960,<sup>11</sup> when less than 5% of patients were managed by

From the Departments of Anesthesia, and Obstetrics and Gynecology, University of Western Ontario and Victoria Hospital, London, Ontario.

Part of this paper was presented at the meeting of the Royal College of Physicians and Surgeons of Canada, Toronto, Ontario, January 1965.

Reprint requests to: Dr. W. E. Spoerel, Professor of Anesthesia, Faculty of Medicine, University of Western Ontario, Medical Sciences Bldg., London, Ont.

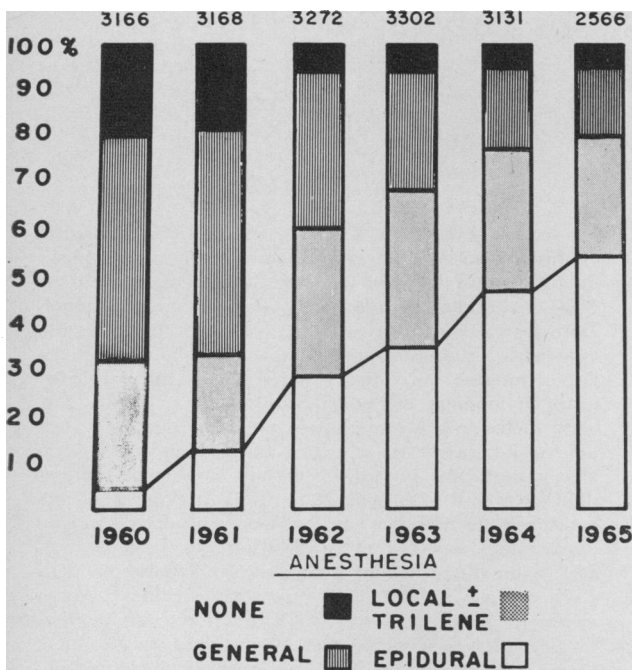


Fig. 1.—Trends in obstetrical anesthesia 1960-1965, Victoria Hospital, London, Ontario. The number of deliveries per year is inserted on top of each column. "Local and Trilene" refers to infiltration of local anesthetic agent, pudendal block, self-inhaled trichloroethylene (Trilene) and any combination of these.

this technique. We are aware of the shortcomings of such comparison from a statistical point of view. Groups of patients selected at random and managed with different anesthetic methods would certainly be more desirable, but such an arrangement is impractical in private obstetrical practice in a general hospital.

#### ANESTHETIC TECHNIQUE

The technique of continuous epidural analgesia used by the anesthetists at Victoria Hospital, London, Ontario, is that described by Bromage.<sup>12</sup> The intention is to block the spinal segments T 11 and 12 during the first stage of labour, and later extend the block to include the sacral plexus to provide anesthesia for delivery.

A pre-set sterile epidural tray, with local anesthetic agents, antiseptic solutions, sterile gloves and emergency drugs, is kept on a portable cart. The epidural catheter is inserted in the labour room or on the delivery table. The patient is placed in a lateral position and the skin of the back is prepared with an antiseptic solution and draped with a sterile fenestrated sheet. Following identification of the interspace between the second and third or third and fourth lumbar spinous process, the point of entrance of the epidural needle is anesthetized with local anesthetic. Through it a No. 17 Tuohy needle is inserted into the spinous ligament and advanced until it is firmly held by that ligament. The stylet is removed and a 10-ml. syringe containing 3-5 ml. of local anesthetic solution is attached. While thumb and index finger of the left hand

steady the needle, the side of the hand resting against the patient's back, the needle is advanced through the ligaments by applying pressure to the plunger of the syringe with the right thumb. As the tip of the needle enters the epidural space, the resistance to injection suddenly disappears and the needle no longer advances with pressure on the plunger ("loss of resistance" technique). Because of variations in density of the ligamentum flavum, careful observance of this technique is important to prevent dural puncture; as long as the needle can be advanced by moderate pressure on the fluid column in the syringe, the needle is outside the epidural space, even though some fluid is expressed.

When the epidural space is reached, approximately 3-4 ml. of anesthetic solution is injected. We consider this a test dose. A small vinyl tubing\* approximately 4 feet long, with two markings indicating one and two needle lengths from the tip, is introduced through the lumen of the Tuohy needle until the second marking reaches the hub. The needle is then withdrawn over the catheter and the latter pulled back until the first marking is at skin level. In the average patient, this will leave 2-4 cm. of the catheter inside the epidural space. The exterior part of the catheter is looped over a sterile gauze pad and taped securely to the back. The patient is then turned to the supine position. Any adverse effects from the test dose, e.g. subdural or intravascular injection, will be evident by this time. All being well, a further 2-3 ml. is injected through the catheter, giving the patient a total dose of about 6 ml. of local anesthetic solution.

The anesthetist remains with the patient until evidence of satisfactory analgesia is obtained. Subsequently, similar doses of 4-6 ml. are given as required, usually at hourly intervals. At regular intervals after each injection, the patient's blood pressure is recorded by the attending nurse. Once the cervix is fully dilated, the terminal injection of 10-15 ml. is made with the patient in a sitting or reverse Trendelenburg position to achieve sacral anesthesia for delivery.

Lignocaine 1.5% with adrenaline 1:200,000 was used in 58% of patients, plain lignocaine in 25%, and mepivacaine 1.0 or 1.5% in 16%. In some cases of prolonged labour, the duration and intensity of analgesia achieved gradually lessened with each injection.<sup>13</sup> This problem was overcome by increasing the concentration, adding adrenaline or changing to another agent.

#### SUCCESS AND DURATION OF EPIDURAL ANALGESIA

Epidural analgesia was considered successful if the patient remained comfortable and did not require other forms of analgesia or anesthesia once epidural analgesia had been started. Such analgesia

\*B-D vinyl tubing I.D. 0.02, wall 0.008, Becton Dickinson and Co., Rutherford, N.J.

was achieved in 881 cases (88%). During labour 39 patients received additional sedation; 13 more had incomplete analgesia but did not receive a supplement; 52 had general anesthesia for delivery, and 15 needed and received both analgesics and anesthesia.

Occasionally, analgesia was predominantly unilateral, presumably because the tip of the catheter was in an unsatisfactory position.<sup>14</sup> Slight withdrawal of the catheter usually corrected this, although in a few cases the catheter had to be reinserted at another interspace.

Additional sedation was sometimes ordered by the obstetrician to counteract anxiety or to relax the patient. At times nitrous oxide or other adjuvant was used during difficult forceps manipulation, or simply because the patient desired to be asleep during delivery. Occasionally delivery was attempted before good perineal anesthesia had been established and supplementary general anesthesia was necessary to allow the obstetrician to proceed. Although the pain of uterine contractions is usually relieved one to three minutes after the injection, it is 10 or 15 minutes after the terminal dose before anesthesia is sufficient for obstetrical operations. Taking into consideration that additional sedation or anesthesia was sometimes used for reasons other than failure of the method, our success rate was greater than the 88% indicated above.

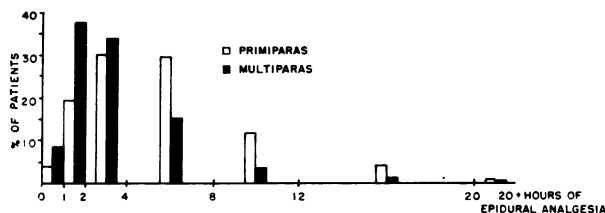


Fig. 2.—Duration of epidural analgesia in primiparous and multiparous patients.

Epidural analgesia, once started, was usually maintained until delivery was completed. The duration of analgesia varied widely (Fig. 2). In 54% of primiparous patients and in 75% of multiparas it was maintained for less than four hours; it exceeded eight hours in 16% of primiparas and 6% of multiparas. The longest case lasted 24 hours.

Epidural analgesia was interrupted by the obstetrician for a time in 21 patients because of apparent weakening or cessation of uterine contractions. Indeed, the absence of pain may give this impression to the inexperienced observer. In our experience, weakening or cessation of contractions is rare and can usually be corrected with small doses of synthetic oxytocin (Syntocinon) by nasal spray. On the other hand, some patients who are making little progress, despite apparently vigorous and painful contractions, progress better after epidural analgesia is begun.

#### SELECTION OF PATIENTS AND DECISION TO START EPIDURAL ANALGESIA

Epidural analgesia was chosen by the obstetrician or the patient; frequently the obstetrician had discussed this procedure with the patient during prenatal office visits. The patients in this study were predominantly primiparas (Table I). It should be noted that the selection of these patients was not actively influenced by the Department of Anesthesia. An anesthetist was available on the obstetrical floor at all times and he usually concurred with the attending obstetrician's choice of anesthesia.

TABLE I.—INCIDENCE OF PARITY

	% of epidural series	% of non-epidural series
Primipara.....	54	35
Para 1.....	27	27
Para 2 and more.....	19	37

The decision to commence continuous epidural analgesia was also made by the obstetrician. The majority were guided by the need for pain relief, some by the progress of labour. Fig. 3 indicates the degree of cervical dilatation in primiparous patients at the start of epidural analgesia. This distribution curve is similar to one relating the need for analgesic medication to the degree of cervical dilatation in primiparas.<sup>15</sup> Fig. 3 also illustrates the tendency of some of our obstetricians to withhold epidural analgesia until the cervix is dilated at least 6 cm.

PER CENT OF CASES AT DEGREE OF CERVICAL DILATATION

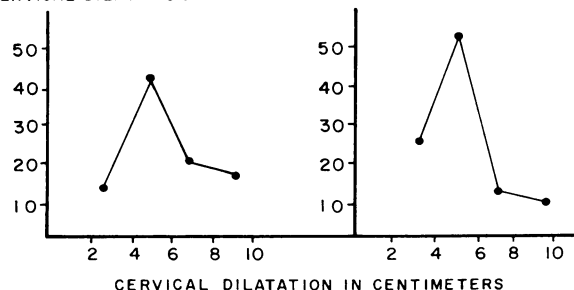


Fig. 3.—Cervical dilatation in primiparas when epidural analgesia was started (left side) and when analgesic drugs were required (right side).<sup>15</sup> (Reproduced, by permission of the publisher, from: Flowers, C. E., Jr., Littlejohn, T. W. and Wells, H. B.: *Obstet. Gynec.*, 16: 210, 1960.)

#### INFLUENCE OF EPIDURAL ANALGESIA ON THE PROGRESS AND DURATION OF LABOUR

When the average length of labour in primiparous patients under epidural analgesia is compared with a control series without epidural analgesia, it can be seen that our patients had a slightly longer duration of labour (Fig. 4). If this technique did prolong labour, the effect should be more

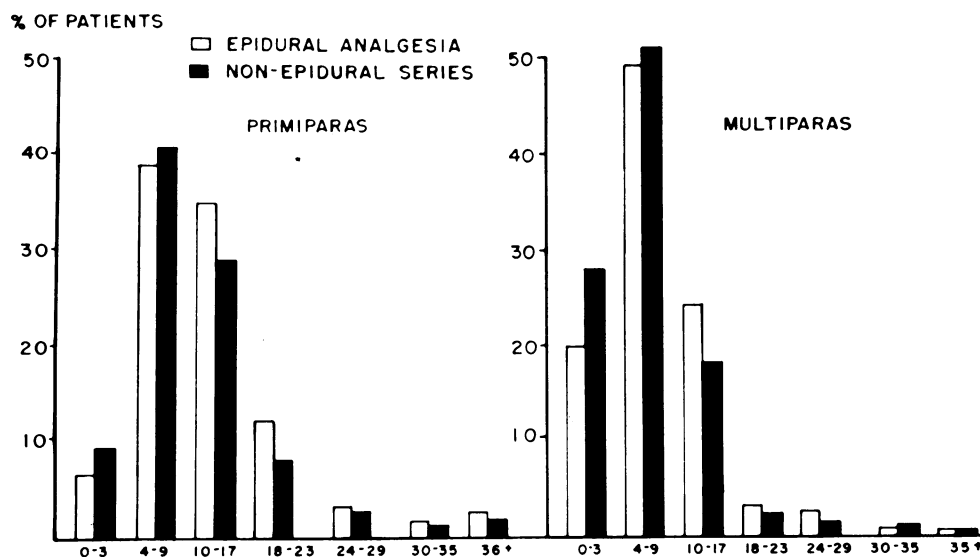


Fig. 4.—Duration of labour (in hours) in primiparous and multiparous patients with epidural analgesia and without epidural analgesia.

marked in patients in whom epidural analgesia was begun in the early stages of cervical dilatation. To make such a comparison, we divided the primiparas into groups, according to the degree of cervical dilatation when epidural analgesia was begun (Fig. 5). It became apparent that the average duration of labour before epidural analgesia was similar in all groups, while the time under epidural analgesia was related to the degree of cervical dilatation. This suggests that patients with a slow and difficult labour have pain which causes them to demand relief at an earlier stage of cervical dilatation. It seems, therefore, that the slower progress of those who had epidural analgesia is due to the inadvertent selection of patients with difficult labour rather than the technique of analgesia.<sup>16</sup>

Adrenaline is known to reduce the contractile force of the uterus. Although the quantity of adrenaline in anesthetic solutions (1:200,000 or 5 µg./c.c.) is small, it has been suggested that it has this effect.<sup>9</sup> We compared the primiparas in whom plain and adrenaline-containing solutions of lignocaine were used. Only the group in which the analgesia was started at less than 4 cm. dilatation

(Table II) showed a prolonged epidural anesthetic time with adrenaline; with more advanced dilatation no such difference was found. The number of cases was too small to be of statistical significance, but the possibility of an adrenaline effect, at least in early labour, cannot be dismissed.<sup>24</sup>

TABLE II.—EFFECT OF ADRENALINE-CONTAINING ANESTHETIC SOLUTIONS ON THE DURATION OF LABOUR IN PATIENTS WHOSE EPIDURAL ANALGESIA WAS STARTED AT LESS THAN 4 CM. DILATATION

	No. of cases	Labour before epidural analgesia (hr.)	Duration of epidural analgesia (hr.)	Total labour time (hr.)
Anesthetic solution with adrenaline . .	30	7.1	8.0	15.1
Anesthetic solution without adrenaline	18	6.2	6.1	12.3

#### METHOD OF DELIVERY

The small amounts of local anesthetic solution sufficient in the first stage of labour are not adequate for the second stage. A terminal injection of 10-15 ml. is usually necessary to block the sacral plexus and provide good anesthesia of the birth canal. As this eliminates the bearing-down reflexes, the patient must be told to push with each contraction if the obstetrician wishes to make use of the extrauterine forces. Although spontaneous delivery can be accomplished in this way, the second stage of labour is often prolonged and termination by outlet forceps is often desirable. Only 8.5% of our patients (mainly multiparas) delivered spontaneously; forceps were used in 89% (Table III).

The pelvic musculature plays an important part in guiding and rotating the fetal head; continuous caudal analgesia has been criticized for relaxing these muscles early in labour and causing an in-

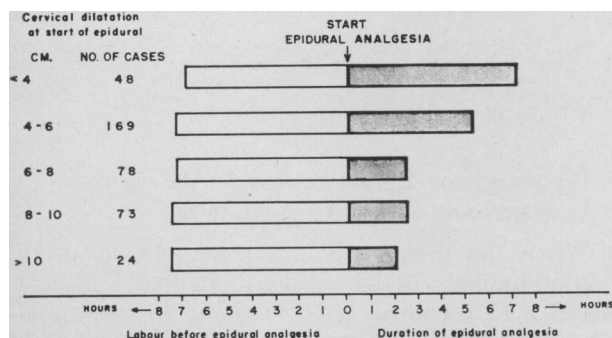


Fig. 5.—Average duration of labour before and after epidural analgesia was started in primiparas. Patients are grouped according to the degree of cervical dilatation at the time epidural analgesia commenced.

crease in posterior presentations. We hoped that the lumbar approach would be more physiological in this regard. However, our incidence of forceps rotation (17.7%) approximated that reported for caudal analgesia (15%).<sup>17</sup> In another 4.4% the diagnosis of posterior presentation was made during the second stage of labour, but from the clinical records we could not determine whether rotation occurred spontaneously at delivery or whether manual or forceps rotation had been done.

TABLE III.—METHOD OF DELIVERY

	Primiparas	Multiparas	Total %	Non-epidural series %
Spontaneous . . . . .	17	70	8.7	50.9
Outlet forceps . . . . .	423	351	77.4	43.8
Mid-forceps . . . . .	82	36	11.8	1.8
Cesarean section . . . . .	20	4	2.4	3.4
Forceps rotation . . . . .	100	77	17.7	5.0

Mid-forceps were used relatively frequently at the time of our study (11.8%); since then this procedure has been used less often as we gained more experience with this method of analgesia.

In 24 patients the infant was delivered by Cesarean section after varying lengths of labour under epidural analgesia. Indications for Cesarean section were: cephalopelvic disproportion in 17 patients, uterine inertia in four, cervical dystocia in two, and abruptio placentae in one. Signs of fetal distress influenced the decision to operate in nine. The average labour for cases terminated by section was 24 hours (range: nine to 44 hours). The average duration of epidural analgesia was 12 hours (range: three to 24 hours). In five patients, epidural analgesia was started before a cervical dilatation of 4 cm. was reached; in four, dilatation was over 6 cm. This incidence of Cesarean section (2.4%) is of the same order as that in an unselected obstetrical population.

#### COMPLICATIONS DURING EPIDURAL ANALGESIA

Maternal hypotension was the most frequent complication. A systolic pressure between 80 and 100 mm. Hg was recorded in 12.9% of cases, and a pressure below 80 mm. Hg in 4.6%. The incidence of a supine hypotensive syndrome was not recorded but because many patients showed improvement with left lateral posturing, this procedure was adopted as the first measure in counteracting low blood pressure.<sup>18</sup>

Hypotension occurred most frequently with the initial injection or with the larger terminal dose. In about one-half of the patients who became hypotensive an intramuscular vasopressor was used, usually methoxamine 10 mg. or methamphetamine 10 mg.<sup>19</sup> No adverse effects on the mother were recorded following hypotension. A possible effect on the fetus will be discussed later.

The dura was punctured with the Tuohy needle in eight patients. This accident was recognized immediately in all and no extensive spinal analgesia resulted. Epidural analgesia was established by

adjustment of the needle or by entering another interspace.

A systemic reaction to the local anesthetic was observed in seven patients. In three (and in two others with no recorded reaction) a free flow of blood into the catheter indicated that an epidural vessel had been entered. In the remaining four patients no blood was seen but the rapid onset of the reaction suggested that a vessel had been punctured. Two of the patients had a transient convulsion and three lost consciousness and had slight muscle twitchings. The remaining two complained of weakness, dizziness, nausea or palpitation, probably caused by the adrenaline. On five occasions the reaction occurred with the terminal injection. We can only assume that the increased efforts of the mother at this time caused distension of the epidural vessels, facilitating puncture by the catheter, or that the more forceful injection used to give the larger terminal dose was in some way responsible. Aspiration of the catheter before injection of each dose is recommended as a precaution against this complication.

Infection of the injection site or breakage and sequestration of a piece of catheter in the epidural space did not occur in any of these patients.

#### EFFECT ON THE INFANTS

The Apgar rating of the infants in our series (Table IV) compared favourably with those from a "non-epidural" control series<sup>11</sup> in which 3.3% of the mature infants had a rating below 6.

Signs of fetal distress were more frequent in mothers with hypotensive episodes (22.8%) than in normotensive mothers (13.3%). No correlation was noted between severity of hypotension and degree of fetal distress, although this observation may not be valid because the blood pressures were recorded intermittently. The Apgar rating was slightly lower in infants of mothers in the hypotensive group than in the overall series. There was relatively little change in the Apgar ratings in infants delivered after forceps or manual rotation (Table IV). Maternal complications of pregnancy and prematurity were most frequently associated with fetal depression at birth; infants delivered by Cesarean section seemed to respond more slowly. The con-

TABLE IV.—APGAR RATINGS

	No. of patients	9/10 %	7/8 %	5/6 %	0/4 %
All patients . . . . .	1000	87.6	9.1	2.0	1.3
Mature infants . . . . .	975	88.5	8.8	1.6	1.1
Premature infants . . . . .	25	52.0	20.0	16.0	12.0
Patients with hypotensive episode . . . . .	175	85.9	8.9	2.4	2.8
Patients without hypotension . . . . .	825	88.0	9.1	1.9	1.0
Forceps or manual rotation . . . . .	220	83.2	10.9	3.6	2.3
Cesarean section . . . . .	24	72.0	24.0	—	4.0
Maternal complications of pregnancy . . . . .	103	75.8	12.6	5.8	5.8
Infants with signs of fetal distress . . . . .	150	78.7	12.0	4.7	4.7

siderable influence of non-anesthetic factors on the Apgar ratings is evident from this table.

#### FETAL MORTALITY

There were 10 fetal deaths in this series; three infants had congenital abnormalities incompatible with survival, and two were premature. In one infant who died shortly after birth, autopsy showed a cerebral infarct. Four infants developed a respiratory distress syndrome: one of these aspirated meconium-stained fluid and had early, marked signs of distress; another had associated Rh incompatibility; in a third the mother had toxemia superimposed on a chronic nephritis.

#### POSTPARTUM COMPLICATIONS

The postpartum course was reviewed to detect complications that might have been related to epidural analgesia. Seven patients had severe prolonged headaches; five of these had inadvertent dural puncture and two had postpartum hypertension. One patient with dural puncture had an unexplained convulsive seizure on the fourth postpartum day. Seventeen patients had mild headache which responded to analgesics.

TABLE V.—POSTPARTUM COMPLICATIONS

<i>Complaint</i>	<i>No. of cases</i>	<i>Transient</i>	<i>Persistent for days</i>	<i>Present at discharge</i>
Pain in area of epidural puncture.....	3	3	0	0
Lumbar pain.....	22	20	2	0
Coccygeal pain....	4	3	1	1
Leg pain.....	8	5	3	0
Sensory or motor disturbance in legs.....	4	2	2	1*

\*Foot drop with slow recovery.

Complaints related to the puncture site, back and legs are shown in Table V. Most of these related to transient conditions and only two persisted beyond the usual hospital stay. Lumbar and coccygeal pain are known sequelae of parturition. Neurological symptoms, unrelated to the anesthetic procedure, such as parasthesia and nerve palsy, have been reported after childbirth.<sup>20</sup>

#### DISCUSSION

Although we do not advocate any single technique as a routine in obstetrical analgesia, continuous epidural analgesia is our first choice for the majority of our patients. On its own merits this technique has become increasingly popular with patients, obstetricians, nurses and anesthetists. Our survey has shown that the risk of this method does not exceed that of other techniques of comparable efficiency, and offers several advantages for mother and infant, the most outstanding of which is adequate control of labour pain without fetal depression.

The use of this technique has required changes in obstetrical management. Pain as an indicator of the activity of labour is eliminated and the parturient's progress must be assessed by more meticulous observation. There is no indication that the first stage of labour is either prolonged or hastened by epidural analgesia, but progress during the second stage is invariably retarded and the termination of this stage by forceps is probably desirable and necessary in almost all patients. Indications for the use of forceps are thus altered; rotation of the fetal head, manually or with forceps, is required more frequently. If he is going to adopt this technique, the obstetrician must have skill and judgment in the use of forceps. The incidence of Cesarean section following epidural analgesia is comparable to that in an unselected group of patients.

Hypotension was the only frequent complication. Its control requires close supervision and frequent blood pressure recordings, particularly after the initial injection. Hypotension has become less of a problem as our experience increased and we began to use minimal effective doses<sup>23</sup> and avoided the supine hypotensive syndrome. Although vasopressors in small doses were used, their value has recently been questioned. Since there is experimental evidence that vasopressors restore maternal blood pressure but do not produce a corresponding improvement in uterine blood flow,<sup>21</sup> they should be used only if they are essential for maternal survival. Displacement of the uterus to the left, elevation of the legs and a rapid intravenous infusion usually restores the blood pressure;<sup>18</sup> in addition, oxygen inhalation is advisable.<sup>22</sup> If they must be employed, vasopressors are best given by continuous intravenous drip while the blood pressure response is measured repeatedly.<sup>19</sup> However, such situations are sufficiently uncommon that we do not start an intravenous infusion routinely; this is done only when there are other indications.

The condition of the infant was usually excellent and resuscitation was rarely required. Forceps rotation and hypotension had only a slight effect on the Apgar rating, although the latter was more frequently associated with signs of fetal distress. Prematurity and maternal complications of pregnancy had a greater influence on the Apgar rating than the technique of anesthesia or obstetrical intervention. The uncorrected fetal mortality in this series was 1%.

Discomfort in the early postpartum period may be slightly greater following epidural analgesia than after other forms of pain relief; however, this is hard to evaluate because many of the latter group were still under the influence of analgesics given during labour. Only patients in whom the dura had accidentally been punctured had significant headache. It was difficult to determine whether there was a slightly greater incidence of transient neurological complications following epidural analgesia; nerve injuries have been observed irrespec-

tive of the mode of obstetrical delivery or the anesthetic technique.<sup>20</sup>

What cannot be presented in figures is the pleasant and quiet atmosphere of the stage room and delivery room. The obstetrician need not rush to the delivery suite; on arrival, he finds ideal conditions for delivery. The anesthetist need not worry about the patient's full stomach and airway obstruction; obstetrical anesthesia no longer resembles an emergency procedure. The mother is comfortable and is not exhausted or heavily sedated at the end of her labour; she is delighted to be fully conscious and able to participate in the delivery of her baby.

#### SUMMARY

The use of continuous lumbar epidural analgesia for pain relief during labour and delivery has increased at Victoria Hospital, London, from less than 5% in 1960 to over 50% in 1965. To assess the effects of this method, 1000 consecutive patients with vertex presentation of the fetus were reviewed.

Epidural analgesia was usually started when the patient was well established in labour and required relief of pain; it was maintained with intermittent injections up to 24 hours. There was no indication that epidural analgesia slowed labour but, on review, an inadvertent selection of patients with slow and painful labour was detected. In 16% of primiparas and 6% of multiparas the analgesia lasted over eight hours.

The second stage of labour was terminated by forceps delivery in 89%; 2.5% required Cesarean section. There was a high incidence of mid-forceps delivery (11.8%). Forceps rotation was used in 17.7%.

The condition of the baby was usually excellent and an Apgar rating of less than 7 was encountered in only 3.3%; prematurity and complications of pregnancy

accounted for most of the fetal depression. There were 10 fetal deaths; three infants had anomalies, two were premature and four died with respiratory distress syndrome.

The most frequent maternal complication was hypotension, and a slight increase in incidence of fetal distress was noted in this group. The dura was punctured in eight patients and a systemic reaction possibly due to intravascular injection was recorded in seven. No complications were attributable to the epidural catheter.

Continuous epidural analgesia is a superior method of pain relief in obstetrics. However, its use requires the services of a knowledgeable and skilled anesthetist and certain adjustments of obstetrical management and nursing care.

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#### PAGES OUT OF THE PAST: FROM THE JOURNAL OF FIFTY YEARS AGO

##### WILLIAM BOYD ON THE CEREBRO-SPINAL FLUID

I wish to direct your attention this evening to a constituent of the body which is of the greatest possible clinical and practical importance, but which has been largely neglected by the general practitioner in the past, and which even yet receives but scant attention from the text-books on diagnostic methods. That, however, as much information of the highest value is to be derived from an examination of the cerebro-spinal fluid as from that of the blood or the urine, it is my object to demonstrate to you to-night.

The naked-eye appearance of the fluid may yield information of the greatest value. The fluid may be blood-stained, turbid, or clear.

*First*, the fluid may be *blood-stained*: The presence of blood may be due to accidental tearing of part of the subarachnoid venous plexus during the puncture, or the blood may have been preëxistent in the fluid. The conditions may be differentiated in two ways.

The demonstration of the presence of preëxistent hæmorrhage in a case with a history of injury to the head is of great practical value, for it points almost infallibly to fracture of the skull with tearing of a meningeal vessel. Cases have been described in which a diagnosis of meningeal hæmorrhage was made from examination of the spinal fluid, the artery was exposed, the bleeding point found and tied,

and the patient's life saved. In a case which I saw recently the diagnosis of fracture of the skull was not made till an examination of the cerebro-spinal fluid had shewn the presence of blood.

*Secondly*, the fluid may be *turbid*. Turbidity indicates the presence of polymorphs, which are never present in the normal fluid, and their presence is as a rule an indication of acute inflammation of the meninges. It is important to note that in cerebral abscess there is no change in the fluid, unless the meninges are involved, or unless the abscess has burst into the lateral ventricles. Thus, if a patient shows signs of acute cerebral trouble, accompanied by a high leucocytosis in the blood, but a normal cerebro-spinal fluid, the probability is that he is suffering from abscess of the brain. This is one of the cases where a negative finding is of positive diagnostic value.

*Thirdly*, the fluid may be *clear*. To conclude from this, however, that it contains no abnormal cells or micro-organisms is an error of the first magnitude. The fluid is not rendered turbid by the presence either of lymphocytes or bacteria. Enormous numbers of lymphocytes may be present in tubercular meningitis, but the fluid may appear quite normal. Again, if the fluid be examined in cases of typhoid shewing marked cerebral symptoms, large numbers of typhoid bacilli may be found, without any increase of cells or other indications suggestive of meningeal inflammation.—W. Boyd: *Canad. Med. Ass. J.*, **6**: 984, 1916.